♂, capite cornu curvato, bifurcato, apicibus haud divergentibus, armato; prothorace antice medio minute bituberculato; pygidio tumido, nitido, irregulariter punctato.
Long. 31 mm., lat. 18 mm.

Hab. Brazil, Castro (Parana Prov.).

A single male specimen in our collection and an almost identical one in that of Mr. O. E. Janson were collected by Mr. E. D. Jones. The species is similar to *B. quadrimaculatus*, Waterh., in form and coloration, but the cephalic horn is not perceptibly narrower at the base than at the apex, the canthus is not produced forwards, but outwards, there is a rudiment of a thoracic horn, and the thorax is uniformly dark in colour. The disc is much more coarsely punctured than in the other species, and the elytra do not show the thick interstitial puncturation of that form.

XVIII.—*Notes on the Classification of Teleostean Fishes.*—III. *On the Systematic Position of the Genus* Lampris, *and on the Limits and Contents of the Suborder* Catosteomi. By G. A. Boulenger, F.R.S.

That extraordinary-looking pelagic fish, the Opah or King-fish (*Lampris luna*), which, from its great size and brilliant colours, always excites much curiosity when landed on our coasts, has hitherto invariably been placed not far from the Mackerels, Scombridæ, or, at least, in the division Scombriformes. Although attention has repeatedly been drawn to the many points in which this fish differs from all Scombriformes, even the most advanced of recent reformers of classification, whilst expressing their doubts as to the propriety of maintaining it in that division, have not ventured to depart from a tradition based solely upon resemblances of the most superficial kind.

An analysis of the characters of *Lampris* at once shows a combination which should exclude it not only from the Scombriformes, but also from the suborder to which that division belongs. The fins are absolutely devoid of spines, the ventrals are abdominal in position and formed of a great number of rays—15 to 17 *,—the mouth is bordered by the maxillaries in addition to the præmaxillaries, if not to a great extent, at least quite as much as in the Scombresocidæ, this

* We have to look back to the Ganoids and the lowest Teleosteans (Elopidæ and Albulidæ) to meet with anything like so high a number.

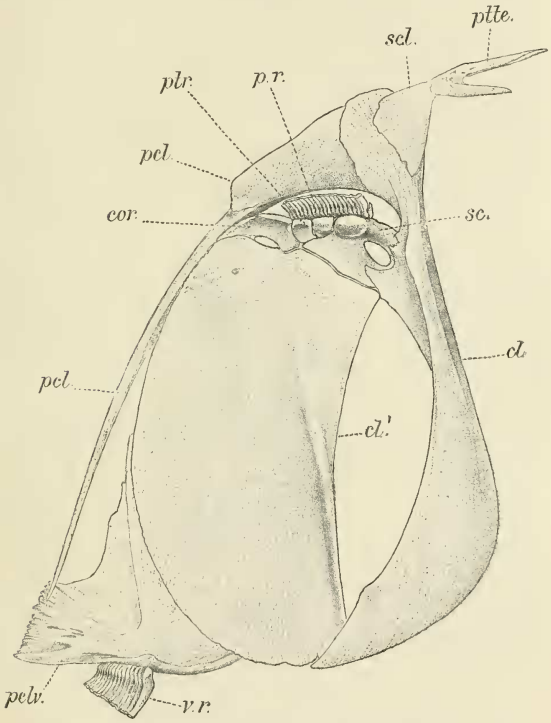
combination of characters indicating a very low position among the Physoclists. Besides, the general appearance of the pectoral arch is altogether unique, and the misinterpretation of the morphological value of its elements is no doubt the reason why the true systematic relations of this fish have so long been overlooked.

In all the descriptions of the skeleton which have been given since the well-known memoir of Bakker* the very large bone to which the pelvis is attached has been identified as the coracoid (or a synonymous element), the bone above it being the scapula, to which four short bones (or, rather, three, the anterior being fused with it) are attached, these being regarded as the basals or pterygials of the pectoral fin. We would thus have a condition, unique among Teleosteans, of the pelvic bone articulating with the coracoid at a considerable distance from the clavicle. Therefore the really "abdominal" position of the ventral fin has been questioned by some authors, in the same way as the state of things in the Sticklebacks was discussed before the homologies of the elements of the pectoral girdle had been realized. On examining the shoulder-bones on a skeleton of *Lampris luna*, I was struck by two things—first, that the disposition of the articulating facets of the pterygials allows of a much greater downward than upward movement of the rays of the pectoral, by which the fin can be pressed down close against the sides of the body, and precludes the opposite vertical position—a fact which I have been able to verify on a specimen in the flesh. This mode of articulation seems so contrary to our ideas that most figures† and stuffed specimens represent the pectoral fin directed upwards, as in a *Brama*, to which the Opah was believed to be related. Secondly, that the posterior of the supposed pterygials does not support rays and is altogether unlike a pterygial, whilst its resemblance to a much reduced coracoid is at first sight obvious. That it is not a pterygial is conclusively proved by the fact, which I have ascertained at the suggestion of my friend Prof. Howes, that it is synchondrosially united with the scapula and the large bone hitherto named coracoid by cartilage, whilst only ligament intervenes between the true pterygials and the bones of the primary shoulder-girdle. If, therefore, this be the coracoid, the large bone between the scapula, the clavicle

* 'Osteographia Piscium; Gadi præsertim Aeglefini, comparati cum Lampride guttato, specie rariori.' Groningen, 1832.

† Those of Gunnerus, Norsk. Bid. Selsk. Skrift. iv. 1768, pl. xii.; Sowerby, Brit. Miscell. pl. xxii. (1834); and Smitt, Scandin. Fish. p. 123 (1893), are correct, being based on fresh specimens.

(cleithrum of Gegenbaur), and the pelvis is not that element; it can be nothing but the bony plate regarded as infraclavicle (clavicle proper of Gegenbaur) in the Teleosteans allied to the Gastrosteidæ (Hemibranchii of Cope). It may be observed



Pectoral arch and pelvis of *Lampris luna*.

cl., clavicle (cleithrum); *cl.'*, infraclavicle (clavicle); *cor.*, coracoid; *pelv.*, pelvis; *p.r.*, pectoral rays; *plr.*, pterygials; *ptte.*, post-temporal; *sc.*, scapula; *scl.*, supraclavicle; *v.r.*, ventral rays.

that, whilst in *Gastrosteus* the so-called infraclavicles appear on the surface of the body, and might be regarded as parts of the exoskeleton, the same bones in *Aulorhynchus* are

covered by the ventral muscles. Among the lower Teleostomi the bones named clavicles proper by Gegenbaur, the morphological significance of which is not open to doubt, are superficial dermal bones in *Polypterus* and Sturgeons, whilst in the Dipneusti they ossify round the primary cartilage of the shoulder-girdle. Therefore, even if the "infraclavicle" of *Lampris* should prove to ossify from the coraco-scapular primary cartilage, this would be no insuperable obstacle to its homology with the clavicle (infraclavicle), which, as we know from the Mammalia, is not always a true membrane-bone *. It would only show that in *Lampris*, in consequence of the great development of the pectoral region, the bone has evolved further than in any other fish.

If this identification of the elements of the shoulder-girdle of *Lampris* be conceded, all difficulties from the systematic point of view disappear at once. The Opah must be regarded as more nearly allied to the Hemibranchii than to any other group of fishes with which we are as yet acquainted. But it possesses important features indicative of both greater generalization and specialization which require the establishment for its reception of a division of at least equal importance with the Hemibranchii and Lophobranchii, and for this division I propose the name Selenichthyes. The close relationship existing between the Hemibranchii (Sticklebacks and Pipe-Fishes) and the Lophobranchii (Needle-fish and Seahorses), realized long ago by Kner and Steindachner † and by Cope‡, are now being admitted on all sides §; Dr. A. S. Woodward ‖ and Dr. Swinnerton ¶ have independently proposed to unite them into one suborder, the former using the term Hemibranchii in an extended sense, the latter proposing the new name Thoracostei, "expressive of the presence in all [Hemibranchii and Lophobranchii] of a more or less complete bony armature, and especially of infraclavicles." Unfortunately neither of these names would be appropriate for the suborder after the addition of the Lamprididæ, in which the branchial apparatus is complete and the dermal

* *Cf.* Gegenbaur, Vergl. Anat. i. pp. 207 & 496 (1898).

† Denkschr. Ak. Wien, xxi. 1862, p. 28.

‡ Tr. Amer. Philos. Soc. (2) xiv. 1871, p. 457.

§ On the difference in the structure of the gills, *cf.* the recent work of A. Huot, Ann. des Sci. Nat. (8) xiv. 1902, p. 197, who shows that there is no fundamental difference, only one of degree, between the so-called tufted gill and the normal type, and that at a certain stage of development the disposition of the branchial lamellæ is the same in a *Syngnathus* and in an ordinary Teleostean.

‖ Catal. of Fossil Fishes, iv. p. 369 (1901).

¶ Quart. Journ. Micr. Sci. xlv. 1902, p. 580.

bony armature absent. I therefore feel compelled to propose a new name to embrace the four divisions Selenichthyes, Hemibranchii, Lophobranchii, and Hypostomides, and have chosen that of Catosteomi (*κατά*, *ὀστέον*, *ὦμος*), in allusion to the additional bone under the shoulder-girdle, which can only be identified with the infraclavicle or clavicle proper of Ganoids and Crossopterygians, and which distinguishes the group from all other Teleosteans. I may add, in further support of the affinity of *Lampris* to the Hemibranchii, that the palatine bone has the single attachment to which attention has first been drawn by Dr. Swinnerton (Acrartrete type).

The diagnostic characters of the suborder Catosteomi and its minor groups are expressed in the following synopsis:—

CATOSTEOMI.

Air-bladder, if present, without open duct. Parietal bones separated by the supraoccipital. Pectoral arch suspended from the skull; no mesocoracoid arch; clavicle (infraclavicle) distinct from the cleithrum. Ventral fins abdominal, if present.

I. Selenichthyes. Præoperculum and symplectic distinct; branchial apparatus fully developed, gills pectinated; mouth terminal, toothless; post-temporal forked, articulated to the skull; pelvic bones connected with pectoral arch; ventral fins with 15 to 17 rays; ribs long, sessile; fins without spines ..... 1. *Lamprididæ.*

II. Hemibranchii. Præoperculum and symplectic distinct, latter much elongate; branchial apparatus more or less reduced, gills pectinated; post-temporal simple, immovably attached to the skull; mouth terminal.

A. Mouth toothed.

1. Pelvic bones connected with pectoral arch; spinous dorsal represented by isolated spines.

Snout conical or but slightly tubiform; ventral fins with one spine and one or two soft rays; ribs slender, free; anterior vertebræ not enlarged ..... 2. *Gastrosteidæ.*

Snout tubiform; ventral fins with one spine and four soft rays; ribs flattened, ankylosed to lateral bony shields; anterior vertebræ not enlarged ..... 3. *Aulorhynchidæ.*

Snout tubiform; ribs slender, free; first vertebra enlarged ..... 4. *Protosyngnathidæ* *.

* Includes a single form, the Tertiary *Protosyngnathus sumatrensis*, which has been referred without adequate grounds to *Aulorhynchus* or *Aulichthys*.

2. Pelvic bones not connected with pectoral arch; ventrals without spine, with 5 or 6 rays; snout tubiform; first vertebra very elongate, formed by the fusion of several.

Isolated dorsal spines; body scaly ..... 5. *Aulostomatidæ.*
No dorsal spines; body naked ..... 6. *Fistulariidæ.*

B. Mouth toothless; snout tubiform; two short dorsal fins, the first with a few spines; ventral fins with 3 to 5 rays; anterior vertebræ elongate.

Body covered with bony shields and small rough scales ..... 7. *Centriscidæ.*
Body completely cuirassed by bony shields which are fused with the endoskeleton ..... 8. *Amphisilidæ.*

III. Lophobranchii. Præoperculum absent; symplectic much elongate; branchial apparatus more or less reduced; gill-lamellæ reduced in number and enlarged, forming rounded lobes; post-temporal simple, immovably attached to the skull; mouth toothless, at the end of a tubiform snout; body covered with bony plates.

Two dorsal fins; ventral fins present, with 7 rays; gill-openings wide; exoskeleton of large star-like plates ..... 9. *Solenostomidæ.*
A single dorsal fin; no ventral fins; gill-openings very small; exoskeleton in the form of rings ..... 10. *Syngnathidæ.*

IV. Hypostomides. Præoperculum and symplectic absent: gills pectinated; mouth inferior, toothless; body entirely covered with bony plates; ventral fin with 2 or 3 rays ..... 11. *Pegasiidæ.*

XIX.—*Descriptions of Two new South-American Apodal Batrachians.* By G. A. Boulenger, F.R.S.

Cæcilia Thompsoni.

Teeth very large in front, 6 or 7 in the upper jaw, 15 or 16 in the lower jaw, 14 vomero-palatines on each side; 8 small inner mandibular teeth. Snout rounded, very prominent, as long as the distance between the eyes, which are very indistinct; tentacle on the lower surface of the snout, nearer the edge of the mouth than the nostril. Body cylindrical, very elongate, its diameter 90 times in the total length; 212 circular folds, most of them narrowly interrupted on the dorsal and ventral regions, the last 36 complete and